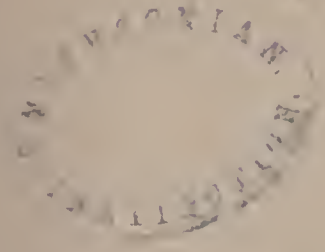

THE DUANE STEEL CORE COMPANY.

Compliments of Mr. Roberts

THE DUANE

STEEL ORE

COMPANY.

ASA L. SHIPMAN & SON, STATIONERS AND PRINTERS,
25 CHAMBERS STREET,
NEW YORK.

1869.

THE DUANE STEEL ORE COMPANY,

CAPITAL, ONE MILLION.

SHARES.....40,000.....$25.

DIRECTORS.

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DUANE STEEL ORE.

In the winter of 1840 and '41 the "Steel Ore" vein adjoining the township of Duane, in Franklin County, New York, and the character of its products, were first brought to public attention by a report of B. S. Roberts, Civil Engineer, who had been appointed by Governor Seward to make a special mineralogical survey of Franklin, Clinton and Essex Counties.

The startling character ascribed to the qualities of eastings direct from the smelting of the ore of this vein, without the use of any of the ordinary mechanical means for its conversion into steel, cast doubts at the time upon the substantial facts Mr. Roberts boldly, and without any reservation, announced as established by his experiments. The thing was novel—wholly so. Nothing of the kind had been before known in the history of iron and steel. The public was not prepared to accredit a report so anomalous, and the discovery of a quality of ore in native state, that, under whatever process of conversion into iron, imparted to the iron inherent *steel* properties, equal, if not superior to any artificial steel known to the mechanical arts, however made in the crucible, or by any other mode of cementation, carbonization and decarbonization.

But this engineer brought to bear upon every fact he reported an array of evidence, in the shape of edged instruments of all kinds, in the form of cutlery and tools for the shops, that could not fail to convince all practical iron workers and mechanics that this ore was, in fact, *peculiar*, producing iron and steel having *special characteristic properties*, unlike any other of the magnetic oxides of iron in our own or any other country.

The *fact* that he had produced edged tools and cutlery from castings, such as razor blades, surgical instruments, planing irons, axes, hatchets, hammers, scythes, &c., &c., equal to similar articles from artificial steel, could not be denied. The specimens were exhibited in the Governor's room at the State House in

Albany. The public press invited all the mechanics and iron men to call and see them, to take them to their shops and try them. They did so. Without any exception the tools were returned, having borne all the hardest tests *uninjured*, and worked well where the best of similar tools of artificial steel *failed*.

In this manner the character of the Duane Steel was established, and the report of Mr. Roberts gained credit, notwithstanding the opposition of the owners of other iron properties in its vicinity and throughout the country, and notwithstanding also the unwillingness of the scientific men of the day to receive as true anything not laid down in "the books." Nothing is hazarded in saying that the reports of the geologist and mineralogist of New York throw little light on the subject of this ore, although its exceptional nature was known to them, and their attention had been invited by the allurements of science, and the importunities of parties interested in bringing this special ore to the aid of the practical arts. Whether they did all that in the poverty of their science, experience, and opportunity of investigation, could be done, is unimportant for us now to inquire.

All the experiments that had been made at those dates, and the most extended and important had been made by Mr. Roberts, were with *castings*. The forged iron from this ore had long been known as a superior iron, having a peculiar hardness, combined with textile strength, that gave it great value for wagon tire. But it had entered into the mind of no one that the forged iron from the Duane Steel Ore was, in fact, a combination of *manganese* and iron in the ore itself, in such proportions, and so chemically united, that no process of smelting or forging destroyed it, and that the Duane Iron, as forged from the pig of the steel ore, *is a natural and indestructible steel*. Such, however, is the fact! It is undeniable, and proved by recent experiments, that leave neither peradventure, cavil or doubt about it.

It is but just to science, the mechanical arts, and existing inquiry in all countries as to the nature of iron and steel, and the most economical modes of producing them, that the peculiar qualities of this vein of natural steel ore, as more thoroughly

demonstrated by recent experiments, should be brought to public attention. It may help the inquiry into the nature of the change by which iron passes into steel, and throw light upon those artificial processes which have in this instance been superceded in the laboratory of nature, and have produced a *perfect* steel.

The most remarkable property of the steel from the Duane Steel Ore is its *indestructibility*. Treatment that decarbonizes, and in time destroys, all artificial steel, has no damaging effect on this. The castings can be melted *indefinitely*, without deterioration, and still take the steel character by the bath of oil or water. The forged iron may be heated to white heat any number of times, and each time treated to its bath of oil or water, taking each time its steel temper without deterioration in any of its qualities of strength, hardness and durability.

Certainly this is characteristic of no other known iron or steel, and justifies the title Mr. Roberts first gave to it of "natural steel."

The crystallization of this ore throughout the mass gives rise to the idea that, after being deposited in the vein by magnetic action, it had been *melted*, and took its crystallization by gradual cooling. Its traverse by trap dyke suggests the origin of the intense heat that melted the great mass of the ore in its bed, by the injection of this trap rock in its lava state from beneath. The uniform density of the entire mass of ore in the vein, without any of the usual cleavage of other masses of magnetic oxides, is another evidence of its having been fused since first deposited. The excessive richness of the ore is also a consequence and an evidence of this, it appearing in the vein almost as solid metal.

The hardness of the ore and the presence of *manganese*, with which it has been found by recent scientific analysis to be heavily charged, renders the theory plausible that both the magnetic oxide, as first deposited, and the manganese, were brought into combination under the intense heat that fused so great a mass of iron, and entered into chemical affinities in such states of fusion and intimate mixture that these affinities are not destroyed or disturbed by any heat that has yet been applied in the reduction of the "steel ore," or its remeltings or

retempering at so many repeated high white heats. Why should it be considered a strange thing that this deposit of magnetic oxide, having been delivered of its impurities by an intense heat, has formed a union of maganese and iron that artificial heat cannot destroy, and made a "*natural maganese steel?*"

The maganese found in this ore would impart the hardness, strength, toughness, and cutting qualities found to characterize all the tools and cutlery made from this "natural steel," and interpret the mystery of the singular and exceptional "black lustre," and the excessive hardness of the crystallized mass in its bed, without cleavage, or tendency to the laminated structure of all other magnetic oxides of iron, in their natural veins.

But the distinguishing characteristics of this "Steel Ore," asserted by Mr. Roberts to be peculiar to this, as contrasted with the other magnetic oxides of Franklin, Essex and Clinton Counties, must find their triumphant demonstration in the products of the vein, rather than from an examination of the vein itself. For such as are interested in iron and steel, entering so largely as they do into all the practical mechanic arts, supplying in this age the most substantial elements of progress, vitalizing every branch of commerce, trade and industry, bringing all countries and peoples into neighborhood, by steamships, the telegraph and railroads, developing the wealth of all countries, and making it co-operative to civilization and advancement, we have left at the office of Foote, Vibbard & Co., No. 40 Broadway, New York, specimens of steel implements recently made from the castings and forged iron of the Duane Steel Ore, for examination and trial.

They will find there razor blades, surgical instruments, penknives, files, cold chisels, &c., hammered out from forged iron into shape, and by no process beyond raising the iron to the degree of heat that may be necessary for the hardness required of the tool—*genuine, indestructible* steel—equal, if not superior, in all cutting qualities and strength, to resist wear and tear, to any similar tools that can be made from the best artificial steel that art and genius of man have ever yet produced.

They will find there cold chisels that will cut the hardest chilled iron, case hardened iron or steel. They will find there

files that will bite into all other steel, however hardened or wrought. These cold chisels and files are made from the ordinary wrought iron from the Duane Steel Ore, and they have undergone no process of manufacture beyond hammering the iron into form, heating it to its red, cherry, or white heat, and plunging it into a bath of water or oil.

We append to this article the report of the artisan in whose workshop, and under whose personal superintendence these instruments were made; for the mechanics, cutlers, and practical workers in iron and steel, and men of large experience in the uses of steel must, after all, decide on the merits of this product and its comparative qualities and value in market. So far as we have submitted it to this class of persons, their testimony has been uniform with that of E. De Witt Riggs, practical cutler, whose certificate is appended.

On the peculiar character of this ore we are at liberty to refer, also, to Charles Blair, Esq., for the past thirty years foreman and superintendent of the extensive works at Collinsville, Conn., who has made trial of this ore, and bears willing testimony to its extraordinary qualities.

In view of the evidence adduced, it would seem safe to conclude that the problem of a "natural steel ore" has been resolved. It is found to be a reality. The object of the Company now formed is to bring it to its great use in the mechanical arts, in the production of a steel that no artificial means known to science can produce. Its wealth to the world will be realized in its superiority, economy, and indestructibility of *temper*, hardness, and unequalled strength of fibrous structure combined.

"Office of E. De Witt Riggs, Razor & Cutlery Works,
"127 Union Street, New Haven, 8*th Dec.*, 1868.

"I have, within the past two years, worked into tools and edged cutlery a number of specimens made from the castings, and from common forged iron, from the ore known as the 'Duane Steel Ore,' in Franklin County, New York. From the beginning of my experiments, two years ago, I was convinced that there were qualities in the iron made from this ore, whether

by casting in the furnace or whether bloomed into malleable iron, altogether novel, and so far as my experience goes, peculiar to this one ore. For instance, I made the best of shears and razor blades from the castings, and I found that heating them to such high heat as destroyed all other steel edged tools I had ever made, they still retained the steel quality of the metal, and by tempering, after repeated re-heatings, took strong and keen edge, and held their edge with wonderful tenacity.

"Yesterday and to-day I have, however, more than ever amazed myself with the results of experiments on a piece of malleable common forged iron from this ore. My forger forged out a thin razor blade from this piece of iron, which was very soft, very malleable, and of great ductile strength. He then submitted this blade to six temperings at high red and white heats. At each re-heat it was re-tempered, and took the highest steel qualities. Re-heating did not in the slightest degree decarbonize the iron, or impair its quality to take steel temper, plunged into the bath of oil or water.

"After the sixth re-heating and tempering I finished the blade on the hone to different edges—first a very fine feather edge its entire length, to try its toughness. The feather edge, bent in all ways, could not be made to crumble, showing a textile and fibrous toughness and strength unknown to me in any steel I have ever worked in my establishment, now twenty years old.

"I then brought it back to the hone and put on the common razor edge. The strength and keenness of this edge so much surprised me that I at once proceeded to try it on my own wiry beard, barely by wetting it, and found a cutting razor edge superior to anything I have ever made from the most costly double refined foreign steel I purchase for my razor blades and other cutlery.

"I do not hesitate now to say, that the qualities of this 'Duane Steel Ore' give to all kinds of iron made from it their peculiar characteristics, and that the styling of 'steel ore' is not a misnomer. I am no chemist, and do not pretend to know anything of metallurgic science, but a practical workman of twenty years' experience in cutlery of all kinds, having used

iron and steel from all parts of the world. I do not hesitate to give my opinion, founded on experiments that would have destroyed any other iron or steel I have ever worked, that this Duane Iron or Steel (by whatever name you call it) is without comparison superior to anything of the kind hitherto known in metallurgy.

E. De Witt Riggs."

"Having been, the past fifty-seven years, a foreman in works of cutlery in England and the United States, and being now in the employment of Riggs & Co., cutlery, New Haven, Conn., I witnessed with surprise, and aided in, the experiments referred to by Mr. De Witt Riggs in the above statement, and confirm all that he has said.

Patrick Harrington."

SCIENTIFIC ANALYSIS.

The Duane Steel Ore was assayed by an eminent American chemist, in Paris, Thomas G. Clemson, Member of the Royal School of Mines, and author of paper upon Physical Geography of the Hartz, its Iron and Silver, &c., &c. (Vol. 19, Am. Journal of Science), and of several analyses of spathic, magnetic iron, and other ores. He gives the following upon the Duane Steel Ore:

The part possessing the properties of Steel,	64.50
Iron alone, ...	12.90
Iron and Scoria, ...	15.42

This assay, giving metallic results, rather than the bases, or chemical constituents of those results, expresses the great practical fact, that 64.50 per cent. of this ore possesses inherent steel qualities, and, however treated, persistently exhibits the same in its products. Later scientific discoveries of the effect of *manganese* upon iron ores and their products, bear particularly, in the light of the above assay, upon the consideration of this ore, as by more recent chemical analysis it has been found to contain a large proportion of manganese while it is free from adverse substances, such as titanium, sulphur, &c., &c.

The directors, however, will not rest satisfied until they have brought to bear upon this ore, its scientific analysis and practical treatment, all that modern discovery and skill can furnish. Its practical development will be entrusted to the most experienced workers and experts in iron and steel, and a corps of scientific men, selected from the most eminent metallurgists of the country, will be employed to assist in that development.

DAMASCUS STEEL.

"The steel of which the beautiful sword blades of Damascus are manufactured has hitherto baffled all attempts at imitation. It is generally supposed to be made of slips, or thin rods, or wires of iron and steel, bound together by iron wire, and then melted together by heat. The most skilful workmen of other countries have attempted to imitate this process, but in vain, so that there is reason to think that the secret of the manufacture has not yet transpired. The color of the Damascus blades is a dull, bluish grey, and scarcely exceeds in hardness common steel from the forge. It is difficult to bend, and when bent, does not resume its shape. The principal character, however, is its *water*, or a peculiar wavy appearance, running from the hilt to the point in narrow lines, the thickness of a harpsichord wire, which never cross each other. These waving lines arise from a slight difference in the degree of polish occasioned by the unequal action of acid upon the steel. Any weak acid would produce this effect, but at Damascus sulphate of alumine is acid. This appearance of waving lines has been imitated by false damasking or etching, but the genuine Damascus blade is distinguished from the false one by the obliteration of the lines in grinding, which takes place in the latter. In the real Damascus blades grinding nearly removes the water, but it immediately re-appears by rubbing the blade with lemon juice."—(Sir David Brewster, Edinburg Ency., 1st ed. Art., "Steel.")

We give at length the above quotation, as the best description possible of the phenomena of the Duane Steel. So close is the resemblance, not only in color and steel qualities, but also in the wavy lines or damascene, that the supposition has arisen in the minds of those who have wrought the Duane Steel into

cutting instruments, that the world renowned Damascus blades were, and are, the product of a natural steel ore, similar to the ore of the Duane vein.

It is hardly supposable that all the practical skill and science of Sheffield and Birmingham, and the best artisans of Europe, should have been baffled so long in the attempt to imitate these blades, were they of artificial steel. The general supposition to which Sir David Brewster refers, that the Damascus steel is "made of slips or thin rods or wires of iron and steel, bound together by iron wire, and then melted together by heat," is evidence that the Damascus blades have the appearance of being composed of narrow alternate bands of hard and soft steel, intimately fused, which is an exact description of the Duane Steel. It has these narrow alternate bands of hard and soft steel intimately fused throughout the entire structure of the steel, and yet is capable of receiving, through the processes of melting and tempering, an edge of any required depth, perfectly homogeneous throughout, and of unprecedented durability.

Undoubtedly it is this "natural steel" structure which gives such wonderful durability to the Damascus blades, and in those countries to which Central Asia distributes a supply of Damascus steel, we find this idea of a composite structure prevalent in the blades they attempt to manufacture for themselves in imitation. The Japanese make their best swords by inserting a projecting steel blade between two plates of iron and forging them together, bringing the iron as near the edge as possible, the union of the two metals appearing in an irregular, waving line, at a distance of half an inch from the edge along its entire length, a mode of manufacture productive of excellent results in the quality of the blade.

This composite quality in the Damascus steel would account also for the ornamentation for which it is so celebrated, the natural soft lines of the metal affording an admirable opportunity for etching in a variety of graceful patterns, easily inlaid with gold and silver. The Duane Steel possesses a similar advantage, and there is no reason why our markets should not within a short time be supplied with a variety of Damascus steel razors, carving and dinner knives, and other steel articles, beautifully ornamented at small expense of time and trouble.

The Damascus blades had their origin in Central Asia, and their distributing point for the west was the City of Damascus. The hostile, nomadic bands, that hold the region east of Damascus closed against travellers, have kept the precise point of their origin a secret to this day, though the supply is still continued through the caravans that annually bring the products of that region to the markets of the east and west. The following extract may throw some light upon the subject, as we may reasonably suppose that the articles of Damascus steel are manufactured at or near their source of supply of ore, it being impossible in those countries to transport the ore to any considerable distance :

" With respect to its manufactures, Karshi, less so, however, than Hissar (at a little distance from it) is distinguished by its fabrication of knives of different kinds. These are not only exported to all parts of Central Asia, but are conveyed by the hadjis to Persia, Arabia and Turkey, where they realize three times, and often four times the cost price. One kind, with Damascus blades and handles with gold and silver inlaid, is really worked with great taste, and might, both for durability and temper, put to shame the most famous produce of Sheffield and Birmingham."—(*Travels in Central Asia.* Vambéry, p. 265. Harper & Brothers, 1865.)

Near the point above described, viz., Karshi or Hissar, appears upon the physical atlas a primitive uplift, corresponding to the geological formation in which the Duane vein occurs. It is on the same parallel of latitude, at nearly or quite the opposite point in the eastern hemisphere. In these days, when the planetary pulsations which upheave cities of one hemisphere, like the late convulsion in South America, are reported by the cable to have been felt at their opposite point on the globe, it is not absurd to suggest that particular mineral uplifts, on the two opposite continents, may have had a simultaneous origin, from one and the same cause convulsing both sides of the planet, and that these corresponding uplifts may carry similar mineral veins. It is a noticeable fact, in this connection, that the primary region in which the Duane Steel occurs is the only portion of this continent supposed by geologists to be cotemporaneous with the older rocks of the continent of Asia.

The Chief Engineer on the Imperial staff of the Czar, Gen. Bailey, an Englishman, who built the railroad through the European Caucasus, has had for some years past his attention directed to the subject of a natural steel, as the only mode of accounting for the character of the implements with which he has become conversant in those regions.

On being shown some specimens of the Duane Steel, he expressed his belief that it was identical in nature with the Damascus steel, and also his expectation at finding at some future time a similar vein of ore in the Caucasian range. It is certain that the ancients had in use, from the earliest period of time, implements that set at defiance everything that modern art can furnish for cutting and drilling. When the obelisk of Luxor was brought to Paris it was found necessary to square its base before it could be placed in position, but no tool could be found which would make any impression on the sienitic granite, and yet clearly cut in this impenetrable granite were the hieroglyphic inscriptions, deeply graven thousands of years ago by the hand of man, using some implement of steel unknown at the present day to the civilization of the west.

It was in the Asiatic Caucasus that Prometheus, the Tubal Cain of Grecian Mythology, was located—chained to a rock for bringing fire and a knowledge of the Arts to man. In one of the spurs of that range, that strike down into the oasis plain where stands the ancient city of Samarcand, the centre of the caravan routes of Asia, and not far from the towns of Karshi and Hissar, of which Vambéry speaks, may be found at some time not far distant the mineral vein which first gave the arts of civilization to the race.

The question of the existence of such a vein of natural steel, or the art by which the Damascus blades are fashioned, cannot remain much longer a secret. The empire of Russia is pushing its military roads into the heart of those countries, and soon the path will be open to the civilized world. It should be a subject of congratulation to us, that whatever may be found to be true on this point, we have upon this continent a source from which we can supply ourselves and the world with a a quality of steel which is unsurpassed by, if not identical with, the famous steel of Damascus.

STEEL ORE VEIN.

The steel ore vein is about fifteen miles south of the town of Malone, in Franklin County, New York. It is situated on the side of a bluff about six hundred feet high, and is traceable for over half a mile southward, it having been opened at its northern extremity. It has been mined to a depth of eighty feet, having been at first worked as an ordinary magnetic oxide, and has been found to be on the steady increase in width and richness as it deseends.

From its elevated position on the side of a bluff it is easily mined, and is also well situated for drainage. The strike or direction of the vein is northerly, a little to the east. The dip is about seventy degrees east. The walls of the vein are gneiss or hornblende. Veins of this elass, in primary regions, are permanent. In Sweden, whose iron district corresponds in character to the iron district of northern New York, they have been worked to the depth of fifteen hundred feet. The vein varies in width from two to eight feet at the surfaee, widening as it deseends.

The ore is of a black color, closely crystallized, has polarity, is free from sulphur, titanium, and other impurities, and is highly charged with manganese. It is exceedingly rich, and of remarkable density. It has been deseribed as a ninety per eent. ore and does not fall far short of this in its metal preduct.

FINANCIAL VALUES.

Any statement, in round numbers, of the eommereial value of even a very moderate amount per annum of the Duane Steel, put into market in the shape of cutlery, tools, and implements of various kinds, would be likely to appear grossly exaggerated. If the foregoing eertificate of a practieal cutler is to be received as evidence, its value per pound for the manufactured artiele exceeds that of the best foreign steel, and it should be so estimated. But waving its inherent superiority, and placing the figures at the lowest possible point, suppose the manufactured artiele of the Duane Steel is sold at one half the usual price, what is the value of one ton of the Duane Steel?

The value of the best foreign steel in the manufactured article,

taking the razor as the standard, and six razors to the pound, is $9.00 per lb. There are 2,000 lbs. in a ton of metal, giving $18,000 per ton, less the cost of manufacture.

Taking the Duane Steel at one half, gives $9,000 per ton, less the cost of manufacture, which, either by casting or forging, bears no comparison in cheapness to the ordinary modes required with artificial steel. The single item—that there is no loss of metal, it being *indestructible*, places the whole subject out of the range of comparison of expense with that of ordinary steel, there being absolutely *no* waste of material, every ounce of this metal being capable of being re-forged and re-cast as long as a particle of it remains. Manufacturers of steel will understand the enormous value of the fact of there being with the use of this metal no such thing as *waste steel scraps.*

The steel ore vein, with a moderate expenditure of capital, is capable of producing from 3,000 to 5,000 tons per annum. Suppose it to produce but 1,000 tons per annum, of the metal, we have a gross product of nine millions, from which is to be deducted the cost of mining and manufacturing. Making the highest estimate of these expenses, leaves from 300 to 400 per cent. per annum profit upon the capital.

Between one and two hundred tons of the ore, which will yield over one hundred tons of the metal, is already delivered from the mine, and ready to be manufactured into implements. The Company have secured a *tract of Fifteen Thousand Acres* of heavily timbered lands, immediately surrounding the mine, through which tract run several rich veins of magnetic oxide of iron.

No estimates have been made of other departments of value, which may arise from the mixture of these magnetic oxides with the steel ore in various proportions. A steel rail may be produced, for instance, which in textile strength, toughness, temper and durability, shall exceed anything heretofore known.

The advantages of the locality of the steel mine for such production are extraordinary. The Company have offers of contracts for charcoal outside of their own lands, at six cents per bushel, deliverable at the mine, which is about one half the price at which it can be obtained in other parts of the country. This

mine being situated on the northern slope of the Adirondacks, within a short distance of the town of Malone, in Franklin County, New York, and easily accessible from Canada, where wages are very low, can also control *labor* at much less than the rates of other parts of the country; and the mine is so situated in reference to transportation, that it can readily distribute its products by rail to all parts of the world.

STOCK OF THE COMPANY.

Only a very limited amount of this stock is offered to original subscribers, *at par*. When subscribed, there will be no more to be issued. Measures have been taken to secure the rights of minority stockholders in this Company—every share of the original capital stock carrying with it a *pro rata* proprietor's interest in the whole property of the Steel Ore Mine and Mineral Tract of Fifteen Thousand Acres—also, a *pro rata* interest in dividends arising from each and every department of manufacture into which the Company shall cause this metal to enter.